**EMD和神经网络混合模型的优化研究及应用**

**摘要：**经验模态分解(Empirical Mode Decomposition ,EMD）是一种对非平稳信号进行处理分析的常用工具，目前在许多科学与工程领域得到了广泛的应用。近年来有大量的学者尝试将该技术应用到时间序列的建模与预测中。股票指数数据作为一种典型的时间序列历来受到广大学者的青睐，所以有学者开始将EMD运用到股票指数的预测研究中。

首先，针对基于EMD算法分解的组合预测模型中模型数量较多、规模复杂、误差累积和计算量大等问题，本文提出了一种基于EMD算法的单一模型预测结构。文中改进了常见的基于EMD和ANN的组合模型，从原来单纯的叠加模型EMD-ANN改进为单一预测模型S-EMD-ANN。实验结果表明，改进的模型在预测的精度上有所提高，在模型运算效率上有显著提高。

其次，针对经验模态分解过程中存在的“前瞻性”偏差问题，本文依据一些学者剔除“前瞻性”偏差的思想，改进了基于EMD和ANN的自适应预测模型。剔除“前瞻性”偏差后，传统自适应混合预测模型AEMD-ANN和S-AEMD-ANN的预测结果并不优于单独的ANN模型的预测结果，所以文中对传统的自适应模型提出了改进。实验结果表明，文中提出的改进模型S-AEMD-ANNa的预测结果明显优于传统自适应模型预测结果，而且也优于单独的ANN模型预测结果。这说明文中提出的改进方案即使EMD算法剔除“前瞻性”偏差也能对ANN模型起到改善作用。

图27幅，表14个，参考文献93篇。

**关键词：**经验模态分解；股指预测；前瞻性偏差；自适应预测

**分类号：**

**Optimization and application of hybrid model of EMD and neural network**

**Abstract：**Empirical Mode Decomposition (EMD) is a commonly used tool for processing and analyzing non-stationary signals. It is currently widely used in many scientific and engineering fields. In recent years, a large number of scholars have tried to apply this technology to the modeling and prediction of time series. As a typical time series, stock index data has always been favored by a large number of scholars, so some scholars have begun to apply EMD to the prediction research of stock indexes.

Firstly, it addresses the problems of large number of models, complex scale, error accumulation and large amount of calculation in the combined prediction model based on the decomposition of EMD algorithm. This paper proposes a single model prediction structure based on EMD algorithm. In this paper, the common combined model based on EMD and ANN is improved, from the original simple superposition model EMD-ANN to the single prediction model S-EMD-ANN. Experimental results show that the improved model has improved the accuracy of prediction, and has significantly improved the computational efficiency of the model.

Secondly, in view of the "Look-ahead" deviation problem in the process of empirical mode decomposition, this paper improves the adaptive prediction model based on EMD and ANN based on the idea of some scholars eliminating the "forward-looking" deviation. After excluding the "Look-ahead" deviation, the prediction results of the traditional adaptive hybrid prediction models AEMD-ANN and S-AEMD-ANN are not better than the prediction results of the separate ANN model, so the paper proposes improvements to the traditional adaptive model. Experimental results show that the prediction result of the improved model S-AEMD-ANNa proposed in this paper is significantly better than that of the traditional adaptive model, and it is also better than that of the ANN model alone. This shows that the improvement scheme proposed in this article can improve the ANN model even if the EMD algorithm removes the "Look-ahead" deviation.

**Keywords:** EMD; Stock index forecast; Look-ahead bias; Adaptive forecast

**Classification:**